Natural Factors Affecting Deer Movement

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Tyson (1952) was the first to correlate the number of deer in a given area with number of tracks. The validity of this census method is dependent on sampling intensity and knowledge of deer movement. Considerable variability per count has been reported (Tyson, 1959; Downing, Moore, and Kight, 1965) but the reasons for this variability, outside of sampling error, have not been investigated.

In this study, data were gathered and analyzed to evaluate the possible effect of vegetation types, moon phases, and weather on deer movement. The track counts were made on eight randomly selected plots, each approximately 1 mile long, along graded roads within Crandall Pasture, an area of approximately 15,000 acres maintained near Fernandina Beach, Florida, by the Southeast Timber Division of Rayonier Incorporated. Counts were made in August of each year from 1962 through 1966. Four counts were made in 1963, and three counts were made in each of the other years.

The eight track-count plots were randomly selected and permanently marked. In the afternoon preceding the day of the count, a drag was used to obliterate all existing tracks. The track counts were then conducted the next morning between 6 and 8 AM, and only those tracks that actually crossed the 1-mile plot roads were tallied. Local weather data were obtained from Imeson Airport, which is 20 airline miles from the census area, for each day that tracks were counted. Moon phases were extracted from the World Almanac and Book of Facts. Percentages of the types of vegetation were recorded for each mile of road.

Discussion

Deer crossings in relation to date of census, approximate mile-long plots, and moon phases were subjected to an analysis of variance. Results of this analysis are presented in Table 1.

The total number of deer crossings counted along the eight 1-mile plots did not differ significantly between moon phases nor between years during the 5-year census period. The most signi-

TABLE 1
Analysis of variance of deer crossings

Source	df	SS	MS	F
Moon phase	3	322	107.33	0.49
Years	4	220	55.00	0.67
Plots	7	24307	3472.43	26.16**
Moon phase x years	12	2645	220.42	2.69**
Moon phase x plots	21	1876	89.33	1.09
Years x plots	28	3717	132.75	1.62*
Moon phase x years x plots	44	3610	82.04	
Total	119	36697		

Note: df, degrees freedom; SS, sum of squares; MS mean square; F, ratio of the mean squares (calculated value).
* Significant
**Highly significant

ficant factor noted in the analysis was that track counts were consistently high in some plots and low in others over the entire 5 census years. This tendency suggests that deer may have a relatively consistent nonrandom distribution or movement which may be due to some unmeasured habitat characteristic. The tendency for track counts to remain stable within a plot (Table 2) suggests that the track count method might give a good indication of variation in deer populations, but the high variability in day-to-day movement of deer necessitates that biologists considering this census method recognize its limitations as a means of estimating deer numbers. Downing et al. (1965) found that 10 or more counts involving some 30 deer crossings per count would be required to detect a 20 per cent difference in deer movement (and probably deer populations) 95 per cent of the time. It is therefore advisable to make several counts of a large number of plots to minimize this variability.

The effect of moon phase-year interaction on deer crossings was highly significant. The reason for this significant interaction cannot be explained biologically, but it appears to be due to the 1963 effect of moon phase, as suggested by the single year analyses shown in Table 3.

A significant interaction occurred between years by plots. Although some plots had consistently more tracks than others, differences were noted from year to year. There is no biological

TABLE 2
Deer track census data arranged chronologically by year and moon phase

Date and Moon Phase	PLOTS 1	2	3	4	5	6	7	8
29 Aug. 62 NM	4	8	10	36	16	43	4	6
*Estimated FQ	2	13	12	34	17	38	8	6
15 Aug. 62 FM	0	9	14	44	28	48	5	0
22 Aug. 62 LQ	2	7	11	37	23	42	5	4
21 Aug. 63 NM	0	23	8	29	5	20	5	12
28 Aug. 63 FQ	2	31	18	30	21	49	7	16
4 Sept. 63 FM	8	12	17	57	21	72	21	6
14 Aug. 63 LQ	4	5	3	18	3	23	8	5
*Estimated NM	1	11	7	39	8	30	15	6
12 Aug. 64 FQ	1	3	5	36	7	20	17	3
19 Aug. 64 FM	1	9	4	28	9	30	18	3
26 Aug. 64 LQ	0	13	7	48	7	51	13	6
27 Aug. 65 NM	2	18	14	74	9	25	12	9
*Estimated FQ	3	13	11	43	10	26	11	7
13 Aug. 65 FM	9	5	5	31	5	20	15	3
20 Aug. 65 LQ	3	5	12	63	10	20	14	10
16 Aug. 66 NM	5	11	11	27	7	19	38	5
23 Aug. 66 FQ	4	21	17	26	9	23	6	6
30 Aug. 66 FM	1	17	17	38	13	65	35	5
*Estimated LQ	2	11	11	35	10	35	18	6

*Estimated—An estimation of missing plot data derived from previously collected data.

explanation apparent, although it is possible that the population may have undergone some shift.

The effect of moon phase-plot interaction was not significant.

Table 4 lists the percentages of the five types of vegetative associations, including open water, for each mile of road census, as well as the total number of tracks counted for each mile during the 5-year study period. The primary purpose of this table is to show the habitat configuration of the area under investigation. The data were insufficient for computing valid statistical relationships.

The data in Table 5 indicate that the uniform weather conditions which prevailed during the track count periods did not have a noticeable effect on deer movement as evidenced by the ex-

TABLE 3
Analyses of variance of deer crossings for years 1962 through 1966

Source	df	SS	MS	F
1962				
Plots	7	6022.50	860.36	90.37**
Moon phases	2	28.09	14.04	1.47
Error	14	133.25	9.52	
Total	23	6183.84		
1963				
Plots	7	4711.72	673.10	6.72**
Moon phases	3	1633.97	544.65	5.44**
Error	21	2102.28	100.11	
Total	31	8447.97		
1964				
Plots	7	4080.63	583.00	13.82**
Moon phases	2	191.50	95.75	2.27
Error	14	590.50	42.18	
Total	23	4862.63		
1965				
Plots	7	5941.63	848.80	12.71**
Moon phases	2	313.00	156.50	2.34
Error	14	935.00	66.78	
Total	23	7189.63		
1966				
Plots	7	2969.83	424.26	3.58**
Moon phases	2	457.75	228.87	1.93
Error	14	1656.42	118.31	
Total	23	5084.00		

Note: df, degrees freedom; SS, sum of squares; MS, mean square; F, ratio of the mean squares (calculated value).

**Highly significant

TABLE 4

Types of vegetation adjacent to census strips and deer tracks counted per mile

Vegetation types	PLOTS 1	2	3	4	5	6	7	8
Flat-woods, %	51	39	52	14	35	50	25	45
Pine-oak uplands, %	15	49	16	13	0	9	0	0
Swamps, %	33	12	29	27	12	40	19	26
Hammocks, %	0	0	2	21	43	1	31	11
Salt water marsh, %	0	0	2	13	4	0	24	17
Open water, %	0	0	0	11	5	0	1	2
Total tracks, number	38	185	156	565	172	502	198	93

Note: For brevity percentage of vegetation has been rounded off.

TABLE 5

Climatic conditions and number of deer crossings tallied during the 5-year census period

Date	Temp. (°F) Avg.	Min.	Average wind speed (mph)	Amount of possible sunshine (Per cent)	Average relative humidity (Per cent)	Total number tracks over the miles
15 Aug. 62	84	74	5.8	87	72	148
22 Aug. 62	85	74	4.1	35	68	135
29 Aug. 62	84	72	4.9	95	66	127
14 Aug. 63	83	72	6.7	50	76	69
21 Aug. 63	79	70	5.9	47	80	102
28 Aug. 63	81	74	6.1	68	81	174
12 Aug. 64	84	76	12.5	56	78	92
19 Aug. 64	78	72	6.2	27	86	102
26 Aug. 64	81	72	7.9	77	74	145
13 Aug. 65	84	75	9.1	67	—	93
20 Aug. 65	84	74	7.1	79	—	137
27 Aug. 65	84	73	8.5	80	—	163
16 Aug. 66	81	72	6.9	82	—	123
23 Aug. 66	86	74	7.0	76	—	112
30 Aug. 66	81	72	10.2	92	—	191
r =	−0.05	−0.03	−0.02	+0.54	−0.23	——

r = correlation coefficient

tremely weak relationships. Downing et al. (1965) also found no correlation between weather and tracks within an enclosure in Georgia.

Conclusions

This study produced evidence that white-tailed deer of the Coastal Plain are nonrandomly distributed but have a consistent pattern of movement. The uniform weather conditions which prevailed during the track count apparently had no effect on deer movement. Deer activity apparently was not associated with any particular moon phase.

Literature Cited

Downing, R. L., W. H. Moore, and Joe Kight. 1965. Comparison of deer census techniques applied to a known population in a Georgia enclosure. Paper presented 19th Ann. Conf. Southeast. Assoc. Game and Fish Comm., Tulsa, Oklahoma, 13 pp. (mimeo).

Tyson, E. L. 1952. Estimating deer populations from tracks. A preliminary report. Presented at 6th Ann. Conf. Southeast. Assoc. of Game and Fish Comm., Savannah, Georgia, 15 pp. (mimeo).

———. 1959. A deer drive vs. track census. Trans. Twenty-fourth N. Amer. Wildlife Conf., pp. 457-464.

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Quart. Jour. Florida Acad. Sci. 30(3) 1967 (1968)